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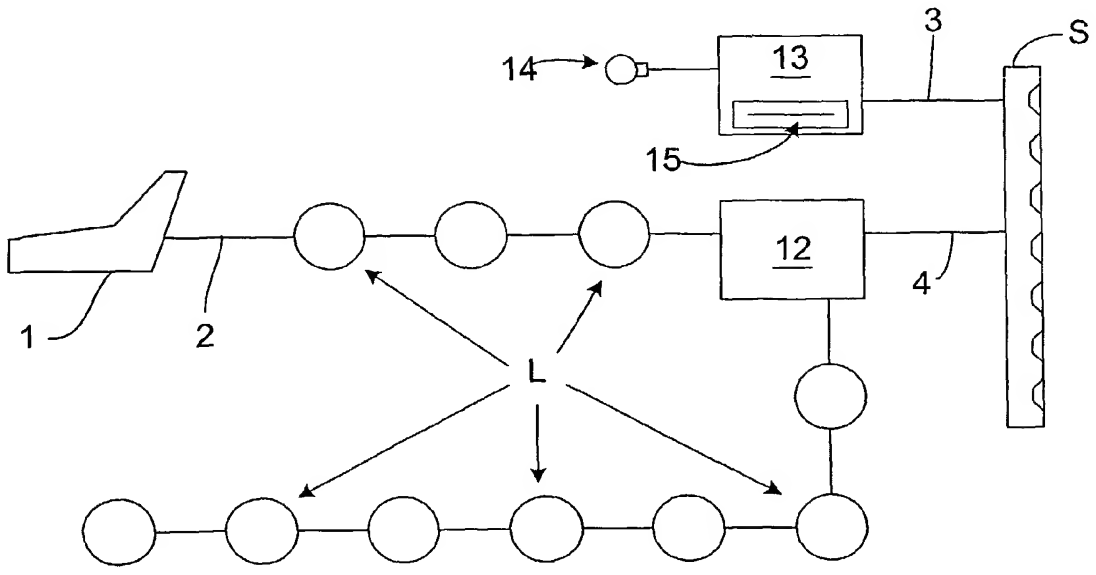
(54) Title: CONTROLLER INTERFACE FOR DIRECTIONAL SOUND SYSTEM



(57) Abstract: The invention provides an interface for coupling a standard lighting or camera control console to a directional sound unit of the type comprising an array of sonic output transducers. The interface operates such that one or more directional sound beams can be controlled by the lighting control console as if they were light beams. The interface may be a separate component or incorporated into the housing of the directional sound unit. This allows combined light and sound shows to be provided using a single control console.

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CONTROLLER INTERFACE FOR DIRECTIONAL SOUND SYSTEM

The present invention relates generally to the control of one or more directional sound units. More particularly, the invention relates to a particularly convenient way of controlling such units using already existing control consoles.

WO 01/23104 discloses a directional sound unit (referred to as a directional acoustic antenna) comprising a plurality of transducers arranged in an array and each arranged to receive a sound signal independently. One or more input sound signals are replicated, delays are applied to each replica and each delayed replica of the input sound signal is supplied to a single output transducer. In use, the delays are chosen such that the sound field obtained is directional, that is to say, beams or anti-beams of sound can be directed in a particular direction in a controlled manner. This means the sound can be mainly directed in a particular direction or focussed at a particular spot. Similarly, quiet spots (or "null points") can be created in the sound field.

WO 01/23104 discloses a number of ways to control how the sound field is shaped as pre-recorded or live sound signals are played back. One method involves using two steerable beams of light which are under the control of an operator, for example using a joystick, with appropriate control electronics to ensure that the sound is directed or focussed at the point of intersection of the two light beams. A second method comprises recording an information signal associated with a recorded audio signal, the information signal providing information as to how the sound field should be shaped at any particular time. Thus, when the audio signal is played back on the apparatus, the information signal is read out and the directional sound unit uses this information signal to direct the sound appropriately.

These methods, however, have disadvantages. The first method suffers from the disadvantage that it cannot be used in conjunction with a light show, for example in a nightclub, because the beams of light used to direct the sound field would interfere with the light show. Furthermore, the first method is really only suitable for setting up a sound field which does not change thereafter and is not suitable for providing a dynamic sound field in which the direction of sound changes with time,

preferably in correspondence with features of the sound signal itself or in conjunction with a light show.

The second method is suitable for playing back a recorded sound signal and controlling the directional sound unit such that the sound field can be manipulated dynamically over time, but suffers from the disadvantage that all audio signals must be pre-recorded along with associated information signals. Thus, the system is not suitable for use in live performances where there are no information signals associated with the audio signals. Even in the case of playing back pre-recorded signals, there is the disadvantage that standard compact discs or mini-discs cannot be used because such standard recording media are not produced by manufacturers with directional sound information.

There is therefore a need for a simple and easy to use control system which can be used in both live performances and when playing back recorded sound that allows the sound field and its development over time to be either pre-programmed or under real-time user control and which can be used in conjunction with a light show and with standard audio recording media such as compact discs purchased from retail outlets.

The present invention addresses these desires by providing a system for directing sound under user control comprising:

a directional sound unit comprising a plurality of sonic output transducers;

a lighting or camera control console; and

an interface connected between said directional sound unit and said lighting or camera control console so that said directional sound unit may be controlled by said lighting or camera control console.

Typically, the lighting control console used has a plurality of output control channels for controlling at least one luminaire and the directional sound unit used has at least one input control channel for controlling the sound field of at least one audio channel output by the directional sound unit. The interface therefore acts to select and interpret particular output control channels from the lighting control console and output control signals that can be read by the directional sound unit.

If a camera control console is used, the interface acts to interpret camera control signals (eg pan, tilt, zoom in, focus etc) and output signals that can be understood by the directional sound unit.

Preferably, the interface comprises input means arranged to read at least one of the plurality of output control channels comprising data in the first format, conversion means for converting the data to a second format, and output means arranged to output the data converted to a second format to the input control channel(s). If necessary, and as use requirements dictate, the input means can be arranged to read more than one output control channel, convert the data accordingly, and output data in the converted format to more than one input control channel. Similarly, the interface can read a plurality of output control channels and output a single input control channel if necessary.

Usually, the lighting control console has the capacity to control a large number of luminaires. In typical applications, the directional sound unit will be connected (via the interface) to the lighting control console along with a plurality of such luminaires. In this case, it is useful that the input means of the interface comprises selection means for selecting which of said plurality of output control channels to read. This allows the interface to choose only those channels which relate to control of that directional sound unit and to ignore channels reserved for controlling luminaires or other directional sound units.

When a camera console is used, the interface may similarly be connected to the console in series or parallel with one or more cameras.

Typically, the plurality of output control channels are multiplexed and the input means comprises a demultiplexer such that the channels assigned to the directional sound unit can be selected.

Suitable directional sound units include those which comprise means for replicating an audio channel, means for delaying each replica by a calculated amount and means for supplying each delayed replica to a different one of the output transducers to thereby achieve a specified directional sound effect.

Preferably, the first format is DMX-512 compliant since this is one of the

most popular formats for controlling luminaires.

For simplicity, the control codes corresponding to luminaire pan, luminaire tilt and luminaire brightness can be used to control sound beam pan, sound beam tilt and sound beam volume respectively. Similarly, control codes corresponding to camera pan, camera tilt and camera focus can be used to control sound beam pan, sound beam tilt and sound beam focus respectively.

The interface may be built in to the directional sound unit itself in which case the invention provides a directional sound unit comprising:

a plurality of sonic output transducers;

an interface as described above;

at least one audio channel input; and

means for controlling the directivity of an audio channel supplied to said at least one audio channel input in accordance with data supplied by said interface.

The present invention further provides an interface for coupling a lighting or camera control console to a directional sound unit so that said directional sound unit may be controlled by said lighting or camera control console.

The present invention furthermore provides a method of controlling a directional sound unit, said method comprising:

using a lighting or camera control console to generate luminaire control signals;

using an interface to convert said luminaire control signals to directional sound unit control signals;

supplying said directional sound unit with said directional sound unit control signals so that the sound field of an audio channel emitted by said unit may be controlled by said lighting or camera control console.

The present invention includes the use of a lighting control console or a camera control console to control a directional sound unit.

Exemplary embodiments of the present invention will now be further described, by way of example only, with reference to the accompanying schematic drawings, in which:-

Figure 1 shows a prior art lighting control console which is connected to a plurality of luminaires by a serial data bus;

Figure 2 shows the main components of a directional sound unit having a single audio input and a separate information signal input used to control the sound field of sound derived from said audio input;

Figure 3 shows a directional sound unit capable of directing a plurality of audio signals independently of one another under the control of a separately provided information signal;

Figure 4 shows an interface according to the present invention installed in a combined light and sound system with the directional sound unit of Figure 2 or Figure 3;

Figure 5 shows in more detail the interface including the internal components thereof;

Figure 6 shows an alternative embodiment to Figure 4 in which audio signals are routed through the interface rather than being applied directly to the directional sound unit;

Figure 7 shows the main internal components of a directional sound unit for use in the embodiment shown in Figure 6;

Figure 8 shows the main internal components of the interface of the embodiment of Figure 6;

Figure 9 shows in more detail the output means of the interface shown in Figure 8;

Figure 10 shows a further embodiment of the invention in which the interface and delay controller are combined inside the directional unit; and

Figure 11 shows another embodiment of the invention in which a camera control console is used to control the directional sound unit.

Figure 1 shows a lighting control console 1, for example the "Virtuoso" control console available from Varilite of Texas, USA. The control console is connected to a plurality of luminaires L via a serial bus 2. The luminaires are daisy-chained in series on the bus. The lighting control console 1 is arranged to output a

plurality (eg. 256, 512 or 2048) channels which are multiplexed together in accordance with a particular standard, for example the USITT DMX-512/1990. Each luminaire L attached to the serial bus 2 receives the multiplexed channels and selects those channels which are assigned to it. Typically, each channel is used to control a different function of the luminaire L and each luminaire L is arranged to read a plurality of channels, eg. 14. Typical functions include luminaire tilt, luminaire pan, strobe functions, colour mixing functions and special effects such as ovalizer, frost, amber and dimmer. Thus, user manipulations or preset programs at the control console 1 cause changes to the various settings of the various output channels and the individual luminaires L react to changes on a channel by altering their direction/colour etc. In the DMX standard, each channel comprises an 8 or 16 bit number which corresponds to a particular setting. For example, if a channel is assigned to "tilt" of a luminaire, a value of 0 corresponds to the lowest tilt the beam can occupy and a value of 256 (for an 8 bit number) corresponds to the highest tilt a beam can occupy. Values in between correspond to discrete positions between the lowest and highest tilt positions. It can be arranged that different luminaries are arranged to read the same channels, in which case these luminaires perform in synchronism.

Figure 2 shows a simple embodiment of a directional sound unit of the type disclosed in WO 01/23104. In general, the present invention can be used with any of the sound units disclosed in WO 01/23104.

The illustrated directional sound unit S has an audio channel 3 supplied to it and a control channel 4 supplied to it. The audio channel 3 is routed to replicating and delaying means 5 which comprises a replicator 6 and controllable delay elements 7. The replicator 6 makes replicas of the input audio channel and supplies a replica to each of the controllable delay elements 7. The delay elements 7 then output a delayed replica of the audio channel to a respective output transducer 8. Various effects can be obtained by choosing appropriate delays as is described in WO 01/23104. Each controllable delay element 7 is connected to, and controlled by, a delay controller 9 which calculates the delay value that each delay element 7 should

apply to the replica audio signal that is supplied to the delay element 7. The delay controller 9 computes the delay values in accordance with the control signal 4. In this way, the control signals can be used to control the shape of the sound field created by the audio channel. More generally, filter coefficients may be set rather than delay values, as described in WO 01/23104.

Figure 3 shows a more complex example which can cater for multiple audio channels. A multiplexed stream of audio channels 3 is supplied to a demultiplexer 10 which in turn supplies a separate audio channel to separate replication and delay means 5. Each replication and delay means 5 supply the plurality of outputs to a plurality of respective adders 11 which are in turn connected to the output transducers 8. In this way, separate audio channels can be directed independently using the principle of linear superposition. Again, the delay controller 9 interprets the control signals from the control signal input 4 and supplies delay values (in the case of Figure 3 twelve delay values supplied in total) to the replication and delay means 5.

First Embodiment

Figure 4 shows a first embodiment of a system according to the present invention. A directional sound unit S of the type shown in Figure 2 or Figure 3 is connected via an interface 12 to the serial bus 2 connected in a standard way to a lighting control console 1. Furthermore, a plurality of luminaires L are connected to the serial bus. The luminaires L need not be present although this is advantageous when a sound and light show is to be performed. Similarly, further directional sound units S can be connected via a further interfaces 12 to the serial bus 2.

One or more audio channels are supplied to the directional sound unit S via means 13 which is able to provide the audio channels to the directional sound unit S from one or more sound sources such as a microphone 14 or a compact disc player 15. If more than one audio channel is to be provided at a time, the means 13 may provide a multiplexed output of audio channels 3.

The interface 12 is arranged to read output control channels from the lighting control console 1 and to output control signals 4 which the directional sound unit S is capable of understanding, in order to effect a directional sound field for specified audio channels 3.

The construction of the interface is shown in more detail in Figure 5. As can be seen, the serial bus 2 is connected to input means 16 which read from (but do not write to) the serial bus. The interface also has an output serial bus port so that proper daisy-chaining can be achieved. The input means 16 is arranged to select particular ones of the plurality of output control channels that travel along the serial bus 2. This can conveniently be achieved with dip switches although the interface as a whole can be provided as software in which case the channel selection can be programmable. In the example of Figure 5, five output control channels from the plurality of output control channels on the serial bus 2 are selected by the input means 16. The channels are separated (eg. by demultiplexing) and the content 20 of each channel is transferred to a conversion means 17. The conversion means 17 is operable to convert the data from the output control channels which is typically in a first data format into a second data format readable by the directional sound unit S. This data may be serial or parallel (it is shown as parallel data 21 in Figure 5) and the data is transferred to output means 18 which supply the control signals 4 to the directional sound unit S.

To take a concrete example, the lighting control console 1 outputs 512 channels and the interface 12 is arranged to read channels 64 to 68. In this case, the input means 16 selects channels 64, 65, 66, 67 and 68 from the 512 channels available on the serial bus 2. The channels are separated and the data comprised in each channel 20 is provided to the conversion means 17. In this example, data 20 consists of an eight-bit number. The conversion means is arranged to apply any necessary calculations to the five eight-bit words to ensure that the directional sound unit S receives control signals that cause a directional sound effect that is analogous to the lighting effect represented by the data read by the input means 16. For example, if channel 64 relates to the "tilt" of the luminaire (as far as the lighting

control console is concerned at least) then the possible range of values that the control channel may take (eg. 0 to 256 in the case of eight bit numbers) span the possible range of tilt of the luminaire (eg. 252 degrees for a Clay-Paky Stagecolour 1200 luminaire). Thus, the value 0 relates to a tilt of 0 degrees and the value 256 relates to a tilt of 252 degrees with values inbetween being mapped to correspondingly between tilt angles. In general, the directional sound unit S will be able to tilt a sound beam over a different range, for example, just under 180 degrees since it is generally not possible for the sound unit to direct beams backwards. Therefore, it is not possible to simply provide the raw value from channel 64 to the directional sound unit since a value of 256 corresponds to a tilt angle which is not possible for the directional sound unit to achieve. Thus, in this case, the conversion means 17 serves to limit the values it receives for channel 64 and output the limited value. Thus, when the conversion means 17 receives a value corresponding to an angle of 180 to 252 degrees, it outputs a control signal (which in general will be also be a numerical value) that instructs the directional sound unit S to direct the beam with a tilt angle of 180 degrees (this being the maximum angle possible). The conversion means 17 also applies any other conversion that is required to convert the first format of data on the serial bus 2 into a second format of data for the control signals 4 that the directional sound unit S can understand. For example, the interface 12 can receive eight-bit numbers from the serial bus 2 and output sixteen-bit numbers to the directional sound unit S. The output means 18 will typically include a multiplexer which multiplexes the data in a second format together so that the multiplexed data stream 4 may be read by the directional sound unit. However, this is not necessary and parallel or serial data may be provided direct to the directional sound unit S if the directional sound unit S is arranged to receive such data.

To increase ease of use, the beam of sound should be emulated to "look like" a beam of light as far as the lighting control console 1 is concerned. Thus, if the lighting control console 1 outputs signals which, if they were sent to a luminaire L, would cause a light beam to rotate in space so as to follow a circular path of radius R, the interface should be arranged to read these signals and provide appropriate control

signals to the directional sound unit S such that a sound beam rotates in space with a circular path of radius R. In this way, a beam of sound may be controlled as if it were a beam of light.

It is not always necessary, however, for the sonic effects achievable with a sound beam to be directly analogous to the lighting effect that the lighting control console 1 instructs. For example, as far as the lighting control console 1 is concerned, a particular channel (eg. channel 128) could be assigned to the "strobe" function of a luminaire L. When this value is high the luminaire flashes at a high frequency and when this value is low the luminaire flashes at a low frequency. Of course, a strobe function with a sound beam is less useful and so the interface can be constructed such that values on channel 128 are interpreted as a special sound effect such as a filtering effect to increase the bass or treble of the audio channel being output. In this way, the user at the lighting control console 1 can ostensibly vary the strobe of a light beam knowing in fact that they are varying a particular sonic effect of a sound beam.

The above description refers to a system in which the directional sound unit emulates a luminaire. It is also possible, however, to provide a new luminaire description to the control console which more exactly matches the capabilities of the directional sound unit (eg steering anywhere within a hemisphere).

Second Embodiment

In the embodiment of Figure 4, the directional sound unit S has separate inputs for the audio channels 3 that are to be output and the control signals 4 that determine where each audio channel is directed. Figure 6 shows an alternative embodiment wherein the interface also receives audio channel data 3 and all data is supplied to the directional sound unit S in a consolidated data stream 19. In this case, the directional sound unit S may have a construction as shown in Figure 7 wherein a demultiplexer 20 separates audio channel 3 and control signal 4 data and supplies these data streams to the appropriate internal components in the manner of the

directional sound unit shown in Figure 3. Figure 8 shows the internal components of the interface unit 12 of Figure 6 wherein similar components have the same reference numerals. The main difference between the interface of Figure 8 and the interface of Figure 5 is that the sound channels 3 are supplied by the means 13 to the output means 18 of the interface 12. In this case, the output means 18 multiplexes together not only the control signals 21 but also the audio channels 3 to obtain a consolidated data stream 19.

Figure 9 shows the output means 18 of Figure 8 in more detail. The output means 18 is operable to determine which control signals correspond to which audio channels. Thus, in Figure 9 there are three audio channels 3 and five control signals 21. Control signal 1 corresponds to audio channel 1, control signals 2 and 3 correspond to audio channel 2 and control signals 4 and 5 correspond to audio channel 3. The output means therefore comprises a demultiplexer 22 to separate the three audio channels 3. Each of the audio channels is provided to a separate multiplexer 23 which multiplexes the audio channel 3 with its corresponding control channel 21. The combined control/audio channels are then all multiplexed together in a multiplexer 24 to achieve a consolidated data stream 19.

Preferably, the interface is programmable such that the type of conversion carried out in the conversion means 18 and the correspondence between audio channels and control channels in the output means 18 may be set up by a user before use.

Third Embodiment

In the above embodiments, the interface has been shown as a separate component from the directional sound unit S both logically and physically. However, this need not be the case and the interface may be physically incorporated into the housing of the directional sound unit and, indeed, the interface 12 may be consolidated with the delay control means 9 such that all functions are provided by a single controller. This controller is referenced 12/9 in Figure 10 which shows a

further embodiment of the invention. In this embodiment, audio channels 3 are supplied to the directional sound unit S by the means 13 in the manner shown in Figure 4. However, the directional sound unit S has a controller 12/9 which is operable to read values taken from the serial bus 2 and perform the necessary processing to supply delay values to the various delay means 7. It is to be noted that although a directional sound unit S as shown in Figure 2 capable of directing only a single audio channel 3 is shown in Figure 10, a suitably modified directional sound unit S as shown in Figure 3, capable of directing a plurality of audio channels simultaneously, may equally be used.

The controller 12/9 thus has the function of selecting output control channels from the serial bus 2, converting the data in these channels into delay values (either by a direct calculation or via two stages in which the values are converted into standard control signals and delay values are obtained from the control signals), and then outputting the delay values to the various delay means 7. In this way, the directional sound unit S may be plugged directly into the serial bus 2 as if it were a luminaire L and sound beam control may be effected by the lighting control console 1 without the need to reprogram the lighting control console, since the directional sound unit S emulates a luminaire in most important respects.

With all the above embodiments, a combined light and sound show may be controlled by a single lighting control console and it is possible to move sound beams and light beams in synchronism by arranging for a luminaire L and directional sound unit S to read the same channels from the serial bus 2.

Fourth Embodiment

The present invention also includes the use of a camera control console. An interface 32 can be provided to intercept and decode signals output by a camera control console 31 and supply them to a directional sound unit S. Figure 11 shows a typical configuration which is similar to that shown in Figure 4. Of course, interface 32 is arranged to read the camera control signals and convert them to a format that

the directional sound unit S can understand. In the arrangement shown in Figure 11 a camera 33 is connected in parallel with the directional sound unit S. This contrasts with the arrangement of Figure 4 in which luminaires L are connected in series with the directional sound unit S. It is not particularly important whether the connections are in parallel or in series and it is possible to connect cameras in series and luminaires in parallel for example. The choice of series of parallel connection is determined by the exact format of the camera control channels output by the camera control console 31 and also by whether it is appropriate to daisy chain the various items of apparatus together. As in Figure 4, the sound channel 3 is provided from a separate source (eg. a microphone 14 or a compact disc player 15). However, the audio channel may be multiplexed with the control channels as shown in Figures 6 to 9. The camera control console 31 may also be used to control more than one camera 33 even though only a single camera is shown in Figure 11.

In this embodiment, the directional sound unit S emulates a camera and the interface 32 is capable of converting control signals intended for a camera into control signals that can be understood by the directional sound unit S. For example, control signals relating to camera pan, camera tilt and camera focus can be converted into directional sound unit control signals corresponding to sound beam pan, sound beam tilt and sound beam focus. Sound beam focussing is described in WO 01/23104. As in the above described third embodiment, the interface 32 may be physically incorporated in the directional sound unit S. In this way, a single unit S can be plugged directly into the camera control console 31 and can be directed controlled by that console.

A further development of the invention involves the use of the directional sound unit S in conjunction with a Closed Circuit Television (CCTV) system, as typically used for security surveillance of public spaces. It is often desirable to talk, or send a prerecorded message (e.g. "No smoking permitted in this area"), to people who the CCTV operator can see through the cameras. When this is done using a conventional public address system, the message is often given to many more people than necessary, and may also not be sufficiently attention grabbing for the intended

target. A zoned public address system improves this slightly, but requires the operator to choose an appropriate zone for the message. By having a directional sound unit S steer one of its sound beams to automatically track the camera 33 currently under the control of the CCTV operator, a message can easily be delivered to the person the operator is looking at. Operation can be as simple as having a microphone and a "Push to talk" button.

A CCTV control system typically provides a joystick, or on-screen equivalent, to pan and tilt the currently selected camera, and may also provide zoom and focus controls. In some cases, the pan and tilt controls may send absolute values to the camera - e.g. pan 120 degrees and tilt 60 degrees relative to the camera's home position. In other cases, a much cruder protocol may be used, just sending commands such as "start moving left", and "stop moving left". In this case, it is necessary to rely on absolute position sensing from the pan/tilt mount. This can be provided as an analogue signal using a pair of potentiometers, or (e.g. in the case of the Cohu, Inc 3920 series cameras), as part of the digital protocol.

The interface 32 receives from the camera control console 31 the pan, tilt, zoom and (if available) focus settings for the currently selected camera 33 and calculates the point in space at which the camera 33 is focussed. To do this, it must know the location and orientation of each camera mount. This information is often available to camera control systems (e.g. the Camfunction software from CCTV software). If the focal distance is not available, the interface may assume that the sound should be focussed at a default height (e.g. head height) for that portion of the area under surveillance. Alternatively, rather than focussing the sound on a point, a beam can be created whose coverage approximates the field of view of the camera 33, which is deduced from the zoom setting.

The interface 32 takes the point in space calculated above and, knowing the location and orientation of the directional sound unit S, derives the required sound beam settings (i.e. the delay values to be applied to the sound signal emitted from each output transducer). These can either cause a beam to be focussed on the same point in space, or produce a beam to cover the same approximate area. If it is not

possible for the directional sound unit to provide sound to that location, the CCTV operator can be notified through a warning light, buzzer, or display, and optionally disabling the Push-To-Talk button.

This functionality can conveniently be incorporated into a camera control signal, with one or more directional sound unit control ports. This is a preferred embodiment, as it allows for simple installation, and has the minimum duplication of effort. Alternatively, it can be retrofitted to an existing CCTV installation by intercepting the position feedback signals and the camera selection controls.

CLAIMS

1. A system for directing sound under user control comprising:

a directional sound unit comprising a plurality of sonic output transducers;

a lighting control console; and

an interface connected between said directional sound unit and said lighting control console so that said directional sound unit may be controlled by said lighting control console.

2. A system for directing sound under user control comprising:

a directional sound unit comprising a plurality of sonic output transducers;

a camera control console; and

an interface connected between said directional sound unit and said camera control console so that said directional sound unit may be controlled by said camera control console.

3. A system according to claim 1 or 2, wherein said lighting or camera control console has at least one output control channel for controlling at least one luminaire or camera respectively and said directional sound unit has at least one input control channel for controlling the sound field of at least one audio channel output by said directional sound unit.

4. A system according to claim 3, wherein said interface comprises:

input means arranged to read said at least one output control channel comprising data in a first format;

conversion means for converting said data to a second format; and

output means arranged to output said data converted to a second format to said input control channel.

5. A system according to claim 4, wherein said control console outputs a plurality of output control channels and said input means comprises selection means for selecting which of said plurality of output control channels to read.

6. A system according to claim 5, wherein said plurality of output control channels are multiplexed and said input means comprises a demultiplexer for selecting one or more output control channels.

7. A system according to any one of claims 4 to 6, wherein said first format is DMX-512 compliant.

8. A system according to any one of the preceding claims, wherein said directional sound unit comprises:

means for replicating an audio channel;

means for delaying each replica by a calculated amount; and

means for supplying each delayed replica to a different one of said output transducers to thereby achieve a specified directional sound effect.

9. A system according to any one of the preceding claims, wherein said interface is incorporated into said directional sound unit.

10. An interface for coupling a lighting control console to a directional sound unit comprising a plurality of output transducers so that said directional sound unit may be controlled by said lighting control console.

11. An interface for coupling a camera control console to a directional sound unit comprising a plurality of output transducers so that said directional sound unit may be controlled by said camera control console.

12. An interface according to claim 10 or 11, further comprising:

input means for reading at least one output control channel for controlling at least one luminaire or camera, said at least one output control channel comprising data in a first format;

conversion means for converting said data to a second format, and;

output means for outputting said data converted to a second format to an input control channel for controlling the sound field of at least one audio channel.

13. An interface according to claim 10, wherein said input means comprises selection means for selecting which of a plurality of output control channels to read.

14. An interface according to claim 13, wherein said input means comprises a demultiplexer for selecting one or more output control channels.

15. An interface according to any one of claims 12 to 14, wherein said second format comprises a plurality of delay values each corresponding to a different sonic output transducer of said directional sound unit.

16. An interface according to any one of claims 12 to 15, wherein said first format is DMX-512 compliant.

17. An interface according to any one of claims 12 to 16, wherein said input means is for selecting output control channels comprising said data in a first format corresponding to luminaire pan, luminaire tilt and luminaire brightness respectively and said conversion means is arranged to convert said data in a first format into a second format for controlling pan, tilt and volume respectively of said directional sound unit.

18. An interface according to any one of claims 12 to 16, wherein said input means is for selecting output control channels comprising said data in a first format corresponding to camera pan, camera tilt and camera focus respectively and said

conversion means is arranged to convert said data in a first format into a second format for controlling pan, tilt and focus respectively of said directional sound unit.

19. A directional sound unit comprising:

a plurality of sonic output transducers;

an interface according to any one of claims 10 to 18;

at least one audio channel input; and

means for controlling the directivity of an audio channel supplied to said at least one audio channel input in accordance with data supplied by said interface.

20.. A method of controlling a directional sound unit, said method comprising:

using a lighting control console to generate luminaire control signals;

using an interface to convert said luminaire control signals to directional sound unit control signals;

supplying said directional sound unit with said directional sound unit control signals so that the sound field of an audio channel emitted by said unit may be controlled by said lighting control console.

21. A method of controlling a directional sound unit, said method comprising:

using a camera control console to generate camera control signals;

using an interface to convert said camera control signals to directional sound unit control signals;

supplying said directional sound unit with said directional sound unit control signals so that the sound field of an audio channel emitted by said unit may be controlled by said camera control console.

22. Use of a lighting control console to control a directional sound unit.

23. Use of a camera control console to control a directional sound unit.

24. An interface constructed and arranged substantially as hereinbefore described with reference to the description and/or the accompanying drawings.

25. A system constructed and arranged substantially as hereinbefore described with reference to the description and/or the accompanying drawings.

26. A method substantially as hereinbefore described with reference to the description and/or the accompanying drawings.

FIG. 1

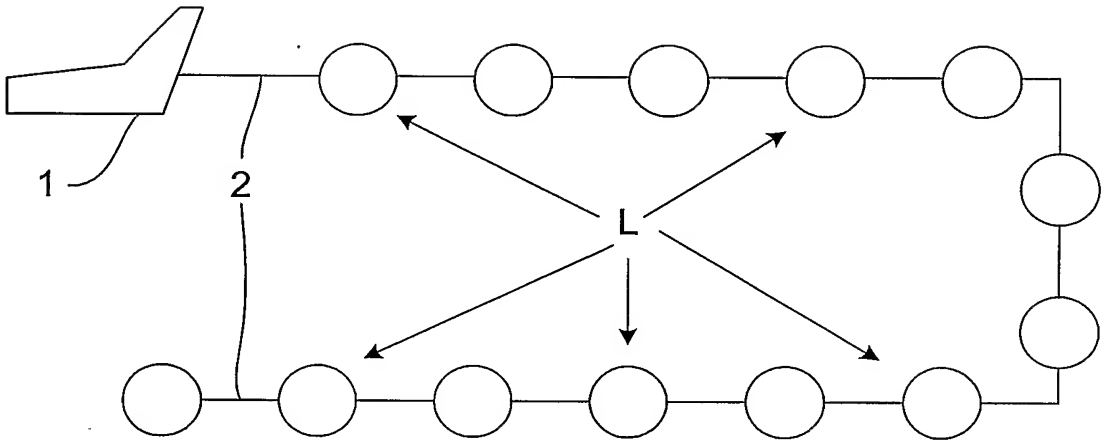

FIG. 2

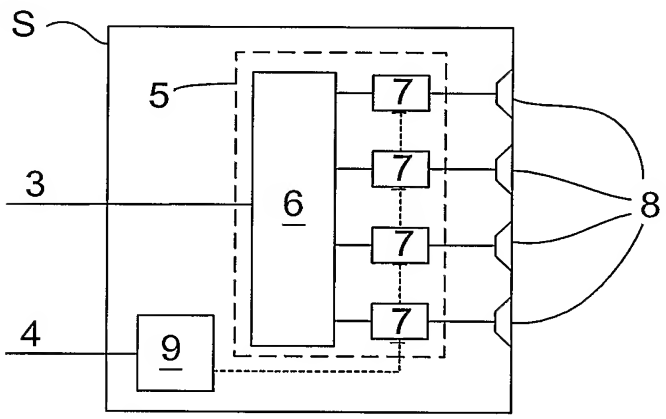

FIG. 3

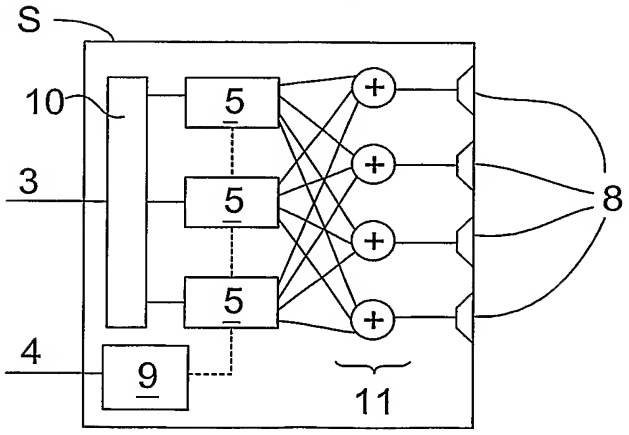

FIG. 4

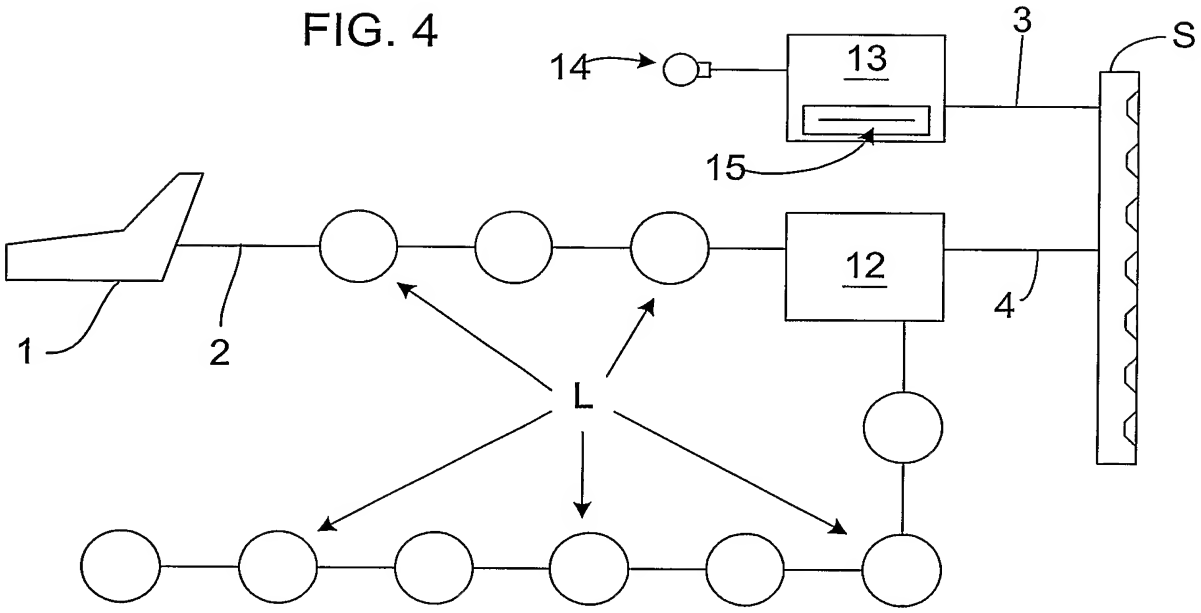

FIG. 5

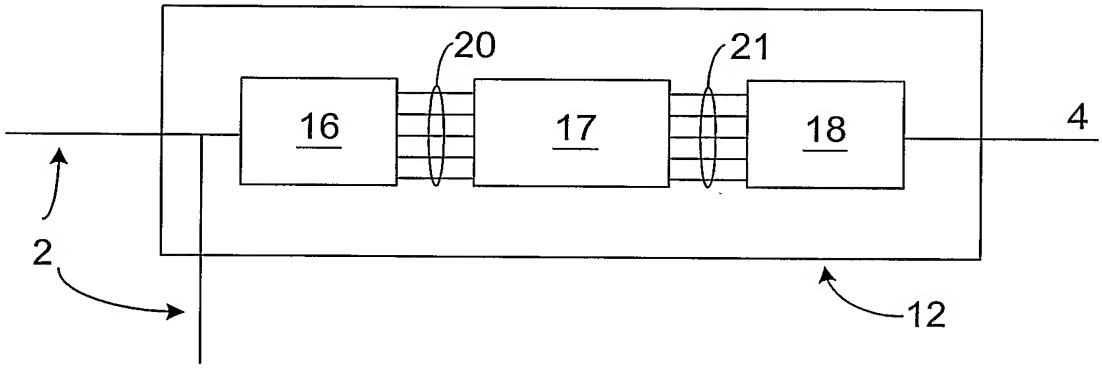

FIG. 6

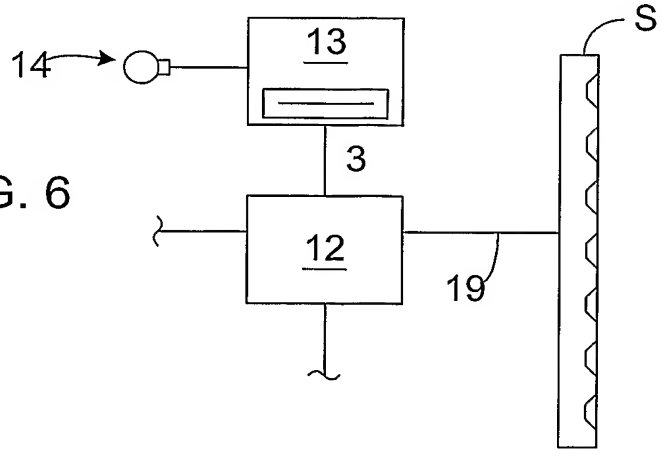

FIG. 7

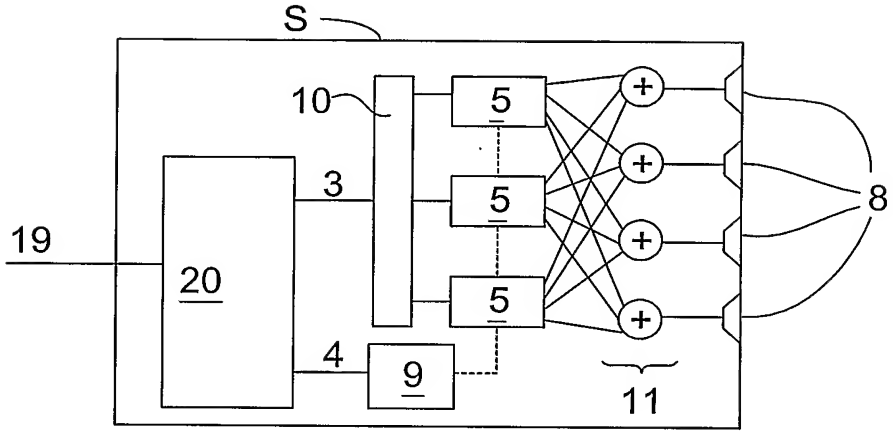

FIG. 8

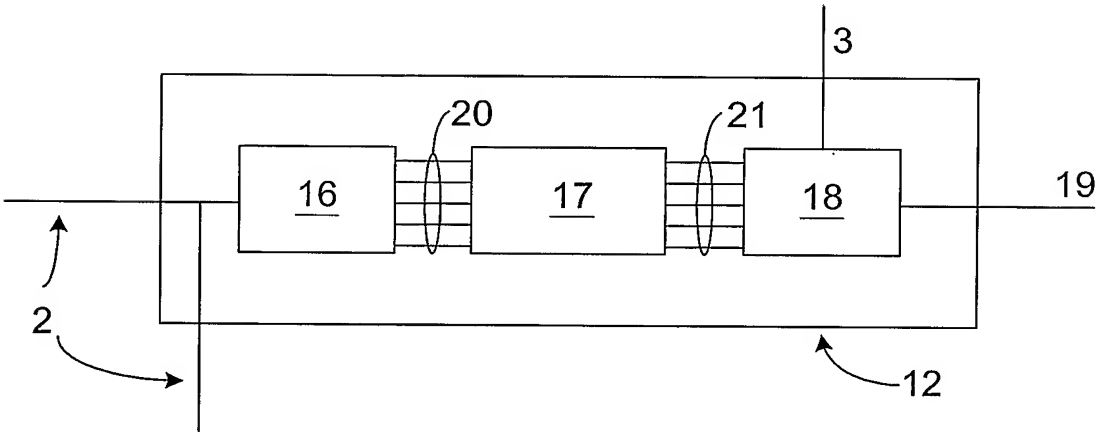

FIG. 9

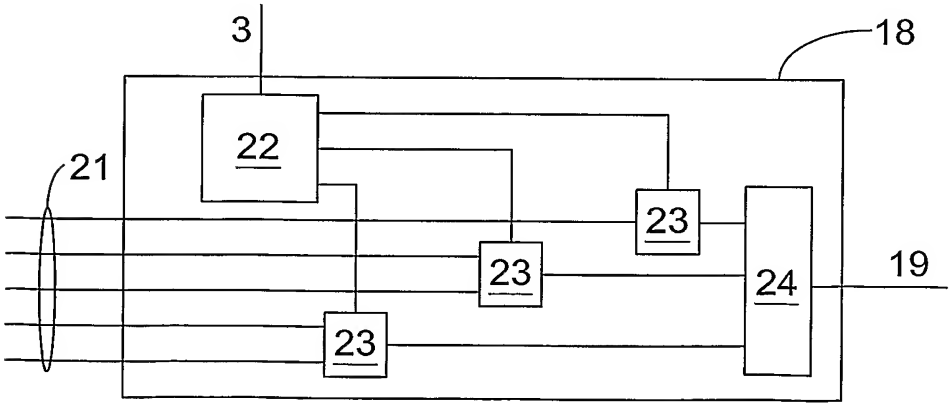

FIG. 10

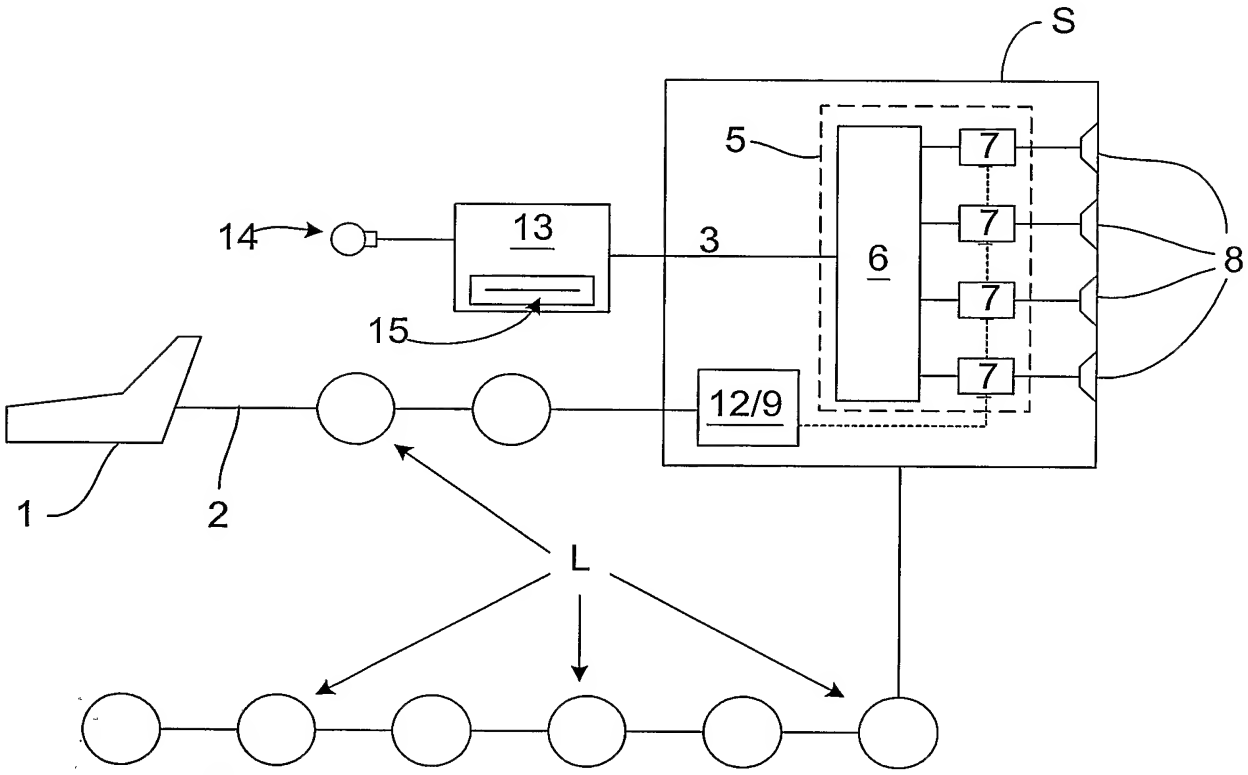

FIG. 11